



## New Jersey Department of Health and Senior Services

# HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CAPROLACTAM**

CAS Number: 105-60-2

DOT Number: None

RTK Substance number: 0337

Date: June 1992

Revision: June 1998

### HAZARD SUMMARY

- \* **Caprolactam** can affect you when breathed in.
- \* Contact can cause skin irritation.
- \* **Caprolactam** can irritate the eyes, nose and throat.
- \* Exposure to very high levels of **Caprolactam** may cause irritability, confusion and convulsions (seizures).

### IDENTIFICATION

**Caprolactam** is a white crystalline solid with an unpleasant odor. It is used in making nylon, plastics, coatings, and synthetic leather.

### REASON FOR CITATION

- \* **Caprolactam** is on the Hazardous Substance List because it is cited by ACGIH, NIOSH and HHAG.
- \* Definitions are provided on page 5.

### HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- \* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from you employer.
- \* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- \* **ODOR THRESHOLD = less than 1 mg/m<sup>3</sup>.**
- \* The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

### WORKPLACE EXPOSURE LIMITS

- NIOSH: The recommended airborne exposure limit for **Caprolactam dust** is **1 mg/m<sup>3</sup>** averaged over a 10-hour workshift and **3 mg/m<sup>3</sup>** not to be exceeded during any 15 minute work period.
- NIOSH: The recommended airborne exposure limit is **Caprolactam vapor** is **0.22 ppm** averaged over an 10-hour workshift and **0.66 ppm**, not to be exceeded during any 15 minute work period.
- ACGIH: The recommended airborne exposure limit for **Caprolactam dust** is **1 mg/m<sup>3</sup>** averaged over an 8-hour workshift and **3 mg/m<sup>3</sup>** as a STEL (short term exposure limit).
- ACGIH: The recommended airborne exposure limit for **Caprolactam vapor** **5 ppm** averaged over an 8-hour workshift and **10 ppm** as a STEL (short term exposure limit).

### WAYS OF REDUCING EXPOSURE

- \* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- \* Wear protective work clothing.
- \* Wash thoroughly immediately after exposure to **Caprolactam**.
- \* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Caprolactam** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

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## HEALTH HAZARD INFORMATION

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Caprolactam**:

- \* Contact can cause skin irritation.
- \* **Caprolactam** can irritate the eyes, nose and throat.
- \* Exposure to very high levels of **Caprolactam** may cause convulsions (seizures).

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Caprolactam** and can last for months or years:

### Cancer Hazard

- \* According to the information presently available to the New Jersey Department of Health and Senior Services, **Caprolactam** has been tested and has not been shown to cause cancer in animals.

### Reproductive Hazard

- \* According to the information presently available to the New Jersey Department of Health and Senior Services, **Caprolactam** has been tested and has not been shown to affect reproduction.

### Other Long-Term Effects

- \* Exposure to high concentrations over many years may cause irritability and confusion.

## MEDICAL

### Medical Testing

Before beginning employment and at regular times after that, for those with frequent or potentially high exposures (half the TLV or greater), the following is recommended:

- \* Exam of the nervous system.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

## WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- \* Where possible, automatically transfer **Caprolactam** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- \* Workers whose clothing has been contaminated by **Caprolactam** should change into clean clothing promptly.
- \* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Caprolactam**.
- \* Eye wash fountains should be provided in the immediate work area for emergency use.
- \* If there is the possibility of skin exposure, emergency shower facilities should be provided.
- \* On skin contact with **Caprolactam**, immediately wash or shower to remove the chemical.
- \* Do not eat, smoke, or drink where **Caprolactam** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
- \* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

## PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Clothing

- \* Avoid skin contact with **Caprolactam**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- \* **Caprolactam** may require handling in the molten state, therefore, heat resistant gloves and clothing are recommended.
- \* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- \* Wear splash-proof chemical goggles and face shield when working with molten **Caprolactam**, unless full facepiece respiratory protection is worn.
- \* Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.

### Respiratory Protection

#### IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- \* NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide pre-filters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
- \* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Caprolactam**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
- \* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters, to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- \* Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

## QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

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The following information is available from:

New Jersey Department of Health and  
Senior Services  
Occupational Disease and Injury Services  
Trenton, NJ 08625-0360  
(609) 984-1863

**Industrial Hygiene Information**

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

**Medical Evaluation**

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health and Senior Services physician who can help you find the services you need.

**Public Presentations**

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

**Right to Know Information Resources**

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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## DEFINITIONS

**ACGIH** is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**HHAG** is the Human Health Assessment Group of the federal EPA.

**IARC** is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

**MSHA** is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NAERG** is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

**NCI** is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**TLV** is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

## HANDLING AND STORAGE

- \* Prior to working with **Caprolactam** you should be trained on its proper handling and storage.
- \* Store in tightly closed containers in a cool, well-ventilated area.

**FOR LARGE SPILLS AND FIRES** immediately call your fire department. You can request emergency information from the following:

## FIRE HAZARDS

- ## FIRST AID

*In NJ, POISON INFORMATION 1-800-764-7661*

## Eye Contact

- \* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

## SPILLS AND EMERGENCIES

If solid **Caprolactam** is spilled, take the following steps:

- \* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
- \* Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation or for disposal in an approved facility.
- \* Ventilate area after clean-up is complete.

## Skin Contact

- \* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

## Breathing

- \* Remove the person from exposure.
- \* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
- \* Transfer promptly to a medical facility.

## PHYSICAL DATA

**Flash Point:** 230°F (110°C)

**Water Solubility:** Highly soluble

## OTHER COMMONLY USED NAMES

**Chemical Name:**

2H-Azepin-2-One, Hexahydro-

### Other Names:

Aminocaproic Lactam; Hexanone Isoxime; 2-Perhydroazepinone

*Not intended to be copied and sold for commercial purposes.*

NEW JERSEY DEPARTMENT OF HEALTH AND  
SENIOR SERVICES

## Right to Know Program

PO Box 368, Trenton, NJ 08625-0368  
(609) 984-2202